European Partnership on Metrology
Call 2023 –Fundamental Metrology, Industry, Normative and Research Potential

Selected Research Topic number: **SRT-r03**
Version: 1.0

Title: Digital workflows and e-services in metrology for small and medium NMIs

Abstract

In the era of digital transformation, metrology institutes are adapting their overall services towards their clients with respect to traceability, accessibility, interoperability and reuse of the provided calibration measurement data. Stakeholders need accessible machine-readable data and hence services providing the data in form of digital documents or interface requests are urgently required. However, the implementation of automated workflows can pose a knowledge and financial obstacle to NMIs with limited resources for digitalisation. The project aims to support the targeted community with capacity building through development of technical frameworks and process recommendations.

Keywords

Harmonisation and modularization approaches, technical frameworks, software development lifecycle, FAIR, data lifecycle, eServices, data governance, calibration measurement data, smart documents, digital transformation

Background to the Metrological Challenges

International efforts are being made in the metrology community to develop harmonised terminologies and document structures regarding smart documents e.g., digital calibration certificates. However, the automated generation of these documents and concepts for adequate data storing, to build applications which at a later stage retrieve the needed data for document generation remain unclear. Moreover, as smart documents are quite a new concept, the probability of constant adaptations throughout the first years of implementation remains high and so does the need to develop dynamically adaptable data acquisition systems with respect to their data streamlines. There is a need to develop interoperable and dynamic adaptable systems that cover the capabilities and properties of relevant measurement devices. In addition, NMIs need a means to acquire and automatically transmit their laboratory data to data streams for various purposes such as generating certificates, sharing data through key comparison measurement, and monitoring long term performance of their laboratories. This would also enable NMIs to enhance their quality assurance processes for developing and peer auditing purposes.

Customers with substantial amounts of measurement devices are not supported with automated service request tools and face bigger logistic/administrative efforts. Processes including human operations, e.g., related to the documentation and handling of calibration data, will typically require several inspection and approval procedures to prevent the occurrence of human errors. Documents provided by NMIs, need to be visually analysed by customers to add relevant administrative and measurement data obtained from the certificates into their own systems, if available. NMI customers are asking for customer interfaces to access and retrieve calibration relevant data with respect to their own devices. Without adequate streamline technologies, NMIs face the challenging task of providing large amounts of data to such customer interfaces.

Current state-of-the-art shows that interlaboratory and/or key comparisons and other processes with respect to document generation including measurement data rely on manual data insertions into their storage systems, hence being dependent from error prone processes. Long term performance tracking is limited due to data access and retrieval possibilities. Currently in small and medium NMIs, the measurement data flow for generating customer related documents involves manual steps. The systems and workflows responsible for generating these documents and/or certificates, further referred to as backend systems, are not designed to implement processes which allow automated data re-orientation for consumer applications linked with customer services and/or comparison interfaces e.g., KCDB.

Currently, there are no frameworks and/or tools that allow NMIs to adapt their backend data systems to provide further internal customer-oriented applications with required data transactions for quality assurance, service and/or research purposes.

Objectives

Proposers should address the objectives stated below, which are based on the PRT submissions. Proposers may identify amendments to the objectives or choose to address a subset of them in order to maximise the overall impact, or address budgetary or scientific / technical constraints, but the reasons for this should be clearly stated in the protocol.

The JRP shall focus on the development of metrology capability in automated calibration measurement data transfer and related document generation.

The specific objectives are

1. To develop a common technical framework within at least two metrology fields, for the automation of calibration data acquisition processes to transfer metrologically relevant information. The framework will consider digital workflows including data model development, usage of streamline technologies for (semi) automated data acquisition, data processing and validation, data reshaping and verification for document generation.
2. To harmonise and modularise calibration data acquisition procedures. To include:
    a. validation and verification of Information and Communications Technology (ICT) communication channels (machine to machine) for at least two metrology fields realised through black box modules and dedicated case studies.
    b. validation and verification of relevant data models/structures of smart documents and service requests, for customer interfaces with unit and integration and application testing.
    c. cross-institutional implementation of workflow modules to assess harmonisation and quality assurance of the proposed technical frameworks.
    d. development of a customer feedback process to provide the desired data to the stakeholders and optimise service request processes.
3. To establish cross-institutional comparison methods, considering a future scaling up of eServices at NMI level, for the automated transfer of calibration data that are relevant for both eServices and the proposed technical framework's validation and verification procedures.
4 To facilitate the take up and long-term operation of the capabilities, technology and measurement infrastructure for digital workflows and eServices developed in the project, by the measurement supply chain (NMIs/DIs, calibration and testing laboratories), and end users (e.g. industry, instrument manufacturers, regulators). The approach should be discussed within the consortium and with other EURAMET NMIs/DIs, e.g. via EURAMET TC-IM and EMNs, and WELMEC/OIML to ensure that a coordinated and optimised approach to the development of traceability in this field is developed for Europe as a whole.

Joint Research Proposals submitted against this SRT should identify

- the particular metrology needs of stakeholders in the region,
- the research capabilities that should be developed (as clear technical objectives),
- the area for which the capabilities will be built (Green Deal, Digital Transformation, Health, Integrated European Metrology, Industry, Normative or Fundamental Metrology) and in which future main call the developed research capabilities are planned to be employed,
- the impact the developed research capabilities will have on the industrial competitiveness and societal needs of the region,
- how the research capability will be sustained and further developed after the project ends.

Proposers should establish the current state of the art and explain how their proposed research goes beyond this. In particular, proposers should outline the achievements of the EMPIR projects 17IND02 SmartCom and 17IND12 Met4Fof and how their proposal will build on those.

The development of the research potential should be to a level that would enable participation in other TPs.

Proposers should note that the programme funds the activity of researchers to develop the capability, not the required infrastructure and capital equipment, which must be provided from other sources.

EURAMET expects the average EU Contribution for the selected JRPs in this TP to be 0.7 M€ and has defined an upper limit of 0.9 M€ for this project.

EURAMET also expects the EU Contribution to the external funded beneficiaries to not exceed 20 % of the total EU Contribution across all selected projects in this TP.

Any industrial beneficiaries that will receive significant benefit from the results of the proposed project are expected to be beneficiaries without receiving funding or associated partners.

Potential Impact

Proposals must demonstrate adequate and appropriate participation/links to the 'end user' community, describing how the project partners will engage with relevant communities during the project to facilitate knowledge transfer and accelerate the uptake of project outputs. Evidence of support from the "end user" community (e.g. letters of support) is also encouraged.

You should detail how your JRP results are going to:

- Address the SRT objectives and deliver solutions to the documented needs,
- Provide a lasting improvement in the European metrological capability and infrastructure beyond the lifetime of the project,
- Facilitate improved industrial capability or improved quality of life for European citizens in terms of personal health, protection of the environment and the climate, or energy security,
- Transfer knowledge to the metrology community and calibration laboratories.

You should detail other impacts of your proposed JRP as specified in the document "Guide 4: Writing Joint Research Projects (JRPs)"

You should also detail how your approach to realising the objectives will further the aim of the Partnership to develop a coherent approach at the European level in the field of metrology and include the best available contributions from across the metrology community. Specifically, the opportunities for:

- improvement of the efficiency of use of available resources to better meet metrological needs and to assure the traceability of national standards
- the metrology capacity of EURAMET Member States whose metrology programmes are at an early stage of development to be increased
- organisations other than NMIs and DIs to be involved in the work.

Time-scale

The project should be of up to 3 years duration.